CLAIMS:

1. A low k interlevel dielectric layer fabrication method comprising:

providing a substrate having integrated circuitry at least partially formed thereon;

forming an oxide comprising interlevel dielectric layer comprising carbon and having a dielectric constant no greater than 3.5 over said substrate; and

after forming the carbon comprising dielectric layer, exposing it to a plasma comprising oxygen effective to reduce the dielectric constant to below what it was prior to said exposing.

2. The method of claim 1 wherein the exposing is effective to increase stability of the dielectric constant to variation from what it was prior to the exposing.

3. The method of claim 1 comprising exposing the carbon comprising dielectric layer to a plasma comprising oxygen effective to reduce the dielectric constant to at least 15% below what it was prior to said exposing.

4. The method of claim 1 wherein the oxygen comprising plasma is at least in part derived from O_2.

5. The method of claim 1 wherein the oxygen comprising plasma is at least in part derived from O_3.

6. The method of claim 1 wherein the oxygen comprising plasma is at least in part derived from N_2O.

7. The method of claim 1 wherein the oxygen comprising plasma is at least in part derived from NO_x.

8. The method of claim 1 wherein the dielectric layer comprising carbon is formed by chemical vapor deposition in a chamber, the exposing occurring within the chamber without removing the substrate from the chamber between the forming and the exposing.

9. The method of claim 8 wherein the chemical vapor deposition is plasma enhanced.

10. The method of claim 1 wherein the temperature during the exposing is always less than or equal to 550°C.

11. The method of claim 1 wherein the plasma exposing is ineffective to appreciably etch the interlevel dielectric layer.

12. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material.

13. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon atoms bonded to both organic material and nitrogen.

14. The method of claim 1 wherein the carbon is present as a CH_3 group.

15. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSiO_y$.

16. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSiO_y$ which remains as $(CH_3)_xSiO_y$ after the exposing.

17. The method of claim 1 wherein the dielectric layer subjected to the exposing consists essentially of $(CH_3)_xSiO_y$.

18. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSiO_y$ which remains as $(CH_3)_xSiO_y$ after the exposing, and wherein the exposing comprises at least 20 seconds.

19. The method of claim 1 wherein a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing.

20. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 20 seconds.

21. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 40 seconds.

22. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 60 seconds.

23. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 80 seconds.

24. The method of claim 1 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 100 seconds.

25. The method of claim 1 wherein the majority of the carbon present in the dielectric layer is in the form of methyl groups, and wherein the methyl groups comprise from 10% to about 50% of the dielectric layer (mole percent) before and after the exposing.

24 34. A low k interlevel dielectric layer fabrication method comprising:

providing a substrate having integrated circuitry at least partially formed thereon;

in a chamber, plasma enhanced chemical vapor depositing an interlevel dielectric layer comprising ~~carbon~~ $(CH_3)_xSiO_y$ and having a dielectric constant no greater than 3.5 over said substrate at subatmospheric pressure; and

after forming the ~~carbon comprising~~ dielectric layer, exposing it to a plasma comprising oxygen at a subatmospheric pressure effective to reduce the dielectric constant by at least 10% below what it was prior to said exposing; the exposing occurring without removing the substrate from the chamber between the depositing and the exposing, and pressure within the chamber being maintained at subatmospheric between the depositing and the exposing.

~~25~~ 35. The method of claim 34 wherein at least two precursors are fed to the chamber during the depositing, one of the precursors comprising oxygen, the exposing comprising substantially ceasing feeding another of the precursors while feeding the one, and maintaining plasma conditions within the chamber from the depositing through the exposing.

36. The method of claim 34 wherein the plasma enhanced chemical vapor depositing comprises feeding a methyl silane to the chamber.

37. The method of claim 34 wherein the dielectric layer comprises silicon bonded to organic material.

38. The method of claim 34 wherein the dielectric layer comprises silicon atoms bonded to both organic material and nitrogen.

39. The method of claim 34 wherein the oxygen comprising plasma is at least in part derived from O_2.

40. The method of claim 34 wherein the oxygen comprising plasma is at least in part derived from O_3.

41. The method of claim 34 wherein the oxygen comprising plasma is at least in part derived from N_2O.

42. The method of claim 34 wherein the oxygen comprising plasma is at least in part derived from NO_x.

43. The method of claim 34 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSiO_y$.

44. The method of claim 34 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSiO_y$ which remains as $(CH_3)_xSiO_y$ after the exposing.

45. The method of claim 34 wherein the dielectric layer subjected to the exposing consists essentially of $(CH_3)_xSiO_y$.

46. The method of claim 34 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSiO_y$ which remains as $(CH_3)_xSiO_y$ after the exposing, and wherein the exposing comprises at least 20 seconds.

47. The method of claim 34 wherein a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing.

48. The method of claim 34 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 20 seconds.

49. The method of claim 34 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 40 seconds.

50. The method of claim 34 wherein the dielectric layer subjected to the exposing comprises silicon bonded to organic material, a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing, and the exposing comprises at least 60 seconds.

51. The method of claim 34 wherein the majority of the carbon present in the dielectric layer is in the form of methyl groups, and wherein the methyl groups comprise from 10% to about 50% of the dielectric layer (mole percent) before and after the exposing.

26. A low k interlevel dielectric layer fabrication method comprising:

providing a substrate having integrated circuitry at least partially formed thereon;

forming a nitride comprising interlevel dielectric layer comprising carbon and having a dielectric constant no greater than 8.0 over said substrate; and

after forming the carbon comprising dielectric layer, exposing it to a plasma comprising nitrogen effective to reduce the dielectric constant to below what it was prior to said exposing.

27. The method of claim 26 wherein the nitrogen comprising plasma is at least in part derived from N_2.

28. The method of claim 26 wherein the nitrogen comprising plasma is at least in part derived from NH_3.

29. The method of claim 26 wherein the nitrogen comprising plasma is at least in part derived from N_2H_4.

30. The method of claim 26 wherein the nitrogen comprising plasma is at least in part derived from N_2O.

31. The method of claim 26 wherein the nitrogen comprising plasma is at least in part derived from NO_x.

32. The method of claim 26 wherein the dielectric layer comprising carbon is formed by chemical vapor deposition in a chamber, the exposing occurring within the chamber without removing the substrate from the chamber between the forming and the exposing.

33. The method of claim 26 wherein the carbon is present as a CH_3 group.

52. A low k interlevel dielectric layer fabrication method comprising:

providing a substrate having integrated circuitry at least partially formed thereon;

forming an interlevel dielectric layer comprising a compound having silicon bonded to both nitrogen and an organic material and having a dielectric constant no greater than 8.0 over said substrate; and

after forming the dielectric layer, exposing it to a plasma comprising nitrogen effective to reduce the dielectric constant to below what it was prior to said exposing.

53. The method of claim 52 comprising exposing the dielectric layer to a plasma comprising nitrogen effective to reduce the dielectric constant to at least 15% below what it was prior to said exposing.

54. The method of claim 52 wherein the nitrogen comprising plasma is at least in part derived from N_2.

55. The method of claim 52 wherein the nitrogen comprising plasma is at least in part derived from NH_3.

56. The method of claim 52 wherein the nitrogen comprising plasma is at least in part derived from N_2H_4.

57. The method of claim 52 wherein the nitrogen comprising plasma is at least in part derived from N_2O.

58. The method of claim 52 wherein the nitrogen comprising plasma is at least in part derived from NO_x.

59. The method of claim 52 wherein the exposing is void of oxygen.

60. The method of claim 52 wherein the dielectric layer is formed by chemical vapor deposition in a chamber, the exposing occurring within the chamber without removing the substrate from the chamber between the forming and the exposing.

61. The method of claim 52 wherein the plasma exposing is ineffective to appreciably etch the interlevel dielectric layer.

62. The method of claim 52 wherein a whole of the dielectric layer subjected to the exposing is not transformed from one base chemistry to another by the exposing.

63. The method of claim 52 wherein the dielectric layer subjected to the exposing comprises $(CH_3)_xSi_3N_{(4-x)}$, with x being greater than 0 and no greater than 4.

64. The method of claim 52 wherein the dielectric layer subjected to the exposing consists essentially of $(CH_3)_xSi_3N_{(4-x)}$, with x being greater than 0 and no greater than 4.

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